Title: Deep Space Network Equipment Performance, Reliability, and Operations Management Information System

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Abstract:

The Deep Space Mission System (DSMS) Operations Program Office and the Deep Space Network (DSN) facilities which consist of the Deep Space Stations (DSS) located at Canberra, Australia, Goldstone, California, Madrid, Spain, and the Ground Communications Facility (GCF) at located at the JPL, Pasadena, California utilize the Discrepancy Reporting Management System (DRMS) to collect, process, communicate and manage data discrepancies, equipment resets, physical equipment status, and to maintain an internal Station Log.

A collaborative effort development between JPL and the Canberra Deep Space Communication Complex delivered a system to support DSN Operations by providing:

- the ability to establish the operational history of equipment items
- data on the quality of service provided to the DSN customers
- the ability to measure service performance
- early insight into processes, procedures and interfaces that may need changing
- the capability to trace a data outage to a software or hardware change

The DRMS is a web-based system featuring a distributed database design and replication feature to achieve location specific autonomy while maintaining high data quality consistency. The DRMS utilizes web (ASP/IIS) and database (SQL Server 2000) technologies from Microsoft.

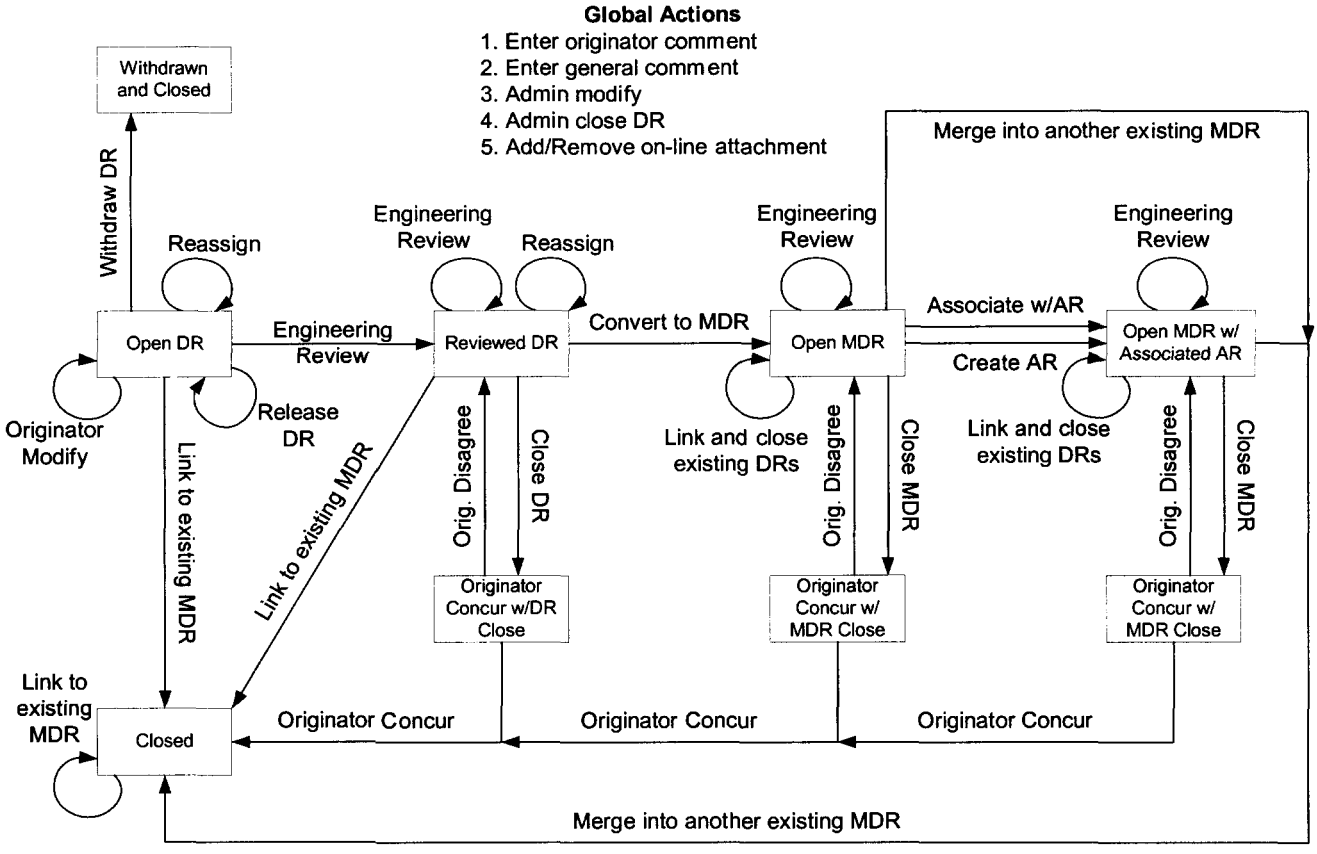
The following features are contained in the DRMS:

- Incorporates business lifecycle and workflow logic
- Simple yet powerful user interface via remote scripting
- Effective use of linking like occurrences to a single source, a Master DR
- Link to Deep Space Mission System (DSMS) Product Structure

- Interface to DSMS Anomaly Reporting System
- Equipment error message reference
- On-line file and URL attachment capability
- Station Log, Equipment Status and Equipment Reset recording
- Robust and flexible query system with user defined queries and time based variables
- Role based E-mail notification and To Do List capability with Proxy functions

The system uses business rules and logic combined with user roles to restrict actions to the relevant users. DR processing is dependent on the cause and the equipment it is written against. DRs written against certain causes (such as weather) are automatically closed. Other causes initiate review action by the site personnel assigned to the equipment, or are directed to the Network Operations Project Engineer or the Customer Support Representatives. Selected global actions are also available to all users.

DRMS Discrepancy Report (DR) Process Flow Diagram



The DRMS has four different record types with distinct processes.

Discrepancy Report (DR):
A discrepancy is any condition that negatively impacts the quantity or quality of committed data or service to a scheduled DSN customer or an internal DSN process that uses the data to support DSN operations such as navigation.

Resets:
Reset records assist the on-site personnel and JPL DSN engineering staff in identifying problems with equipment. Resets may indicate problems that may lead to more serious failures in the future.

Station Log:
Station logs are designed to allow for informal annotations concerning equipment and operations at a DSN site and are internal records. They provide the ability to report on equipment problems that may occur outside of a tracking pass.

Equipment Status Records:
These records enable the global tracking of equipment availability status (Red, Orange, Green, Blue) including historic details.

All DRs, Resets and Equipment Status Changes originated at a DSN facility are replicated to the Master (JPL) database, while DRs originated or acted upon at JPL replicate to the relevant site only. Station Log entries are internal to the DSN site and are not replicated.

The system includes several levels of data validation. It utilizes logical mathematical validation, e.g., data outage cannot exceed the DR duration and cannot be negative. It validates cause with equipment, e.g., you cannot write a SW-cause DR against an item of hardware (and vice versa). It validates "suggestively", in that it prompts originators to confirm selections and offers potential alternatives.

Queries can be performed on any combination of data maintained by the system. A set of 'canned' reports is also available for the user. Engineering, Operations, and Management are now obtaining corporate knowledge of their equipment through performance analysis, data accountability, and accurate reporting.